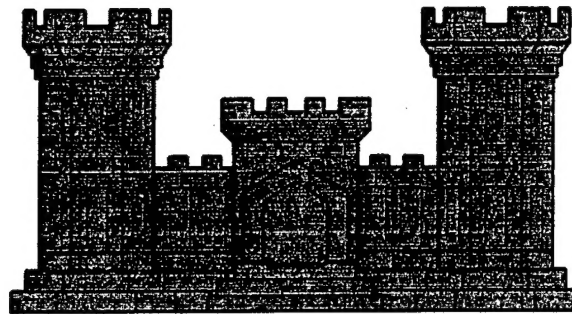


# FINAL REPORT

## FORT GORDON ENERGY SURVEY & ANALYSIS OF BOILER AND CHILLER PLANTS

BUILDING 25910

BUILDING 25330



## PROPOSED ENERGY CONSERVATION OPPORTUNITIES FOR SAVANNAH DISTRICT CORPS OF ENGINEERS CONTRACT NUMBER: DACA21-93-C-0110

## EXECUTIVE SUMMARY

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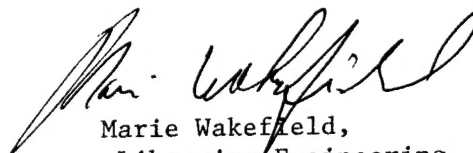


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## EXECUTIVE SUMMARY

This report is the result of extensive field studies to determine the ability of the plants in the North Central and South Utility Buildings to meet current and future heating and cooling demands at Fort Gordon. As described in this document, the ability to meet these demands is based on providing utility services that are cost effective, efficient and reliable. The purpose of this report is to present four opportunities for Energy Conservation Investment Program (ECIP) projects at Fort Gordon. Each ECIP consists of multiple Energy Conservation Opportunities (ECO's). Each ECIP and ECO is described in sufficient detail to support the application process for funding.

Each project has been developed from ECO's that were identified from field survey data. Of the four projects identified, two are for chilled water (CHW) and two for high temperature water (HTW). The four projects (ECIP's) are:

Project 1:	Chilled Water System North Plant, Building 25910
Project 2:	Chilled Water System South Plant, Building 25330
Project 3:	High Temperature Water System North Plant, Building 25910
Project 4:	High Temperature Water System South Plant, Building 25330

Each project contains the following information:

Descriptive Summary:	An overview of the project to be done and the affected equipment.
ECO Data Compilation:	A list of each ECO, Description and an Economic Summary.
ECO Methodology:	A description of the ECO and the cost methodology.
Construction Cost Estimate:	A list of the elements and costs relative to each ECO.
LCCA:	The life cycle cost analysis summary for each ECO in the project.
Loads:	The heating and cooling load demands from the buildings serviced by the plant.
Form 1391:	The basic form for an ECIP is completed for each project.
Schematic:	A graphical representation of the System proposed by the ECIP.

**Chilled Water System Improvements:** Several innovative modifications to the central Chilled Water systems in each plant are offered. In addition to chiller replacement, recommendations to add heat exchangers for free cooling, chilled water storage and variable speed chilled water pumping will complete a modernization program that will bring the plants up to state of the art levels. The addition of sensors and controls for connection to the base EMCS system opens up significant opportunities for additional energy savings, reduced system failures, reduced manpower requirements and increased life on equipment by early detection of component degradation.

**Hot Water System Improvements:** Several innovative modifications to the central High Temperature Water systems in each plant are offered. Replacement of existing boilers with new High Temperature generators will dramatically improve plant efficiency, but not unless other measures are taken as well. Variable speed pumping for the hot water, changes to water temperature controls and the addition of instrumentation for integration into the EMCS system will all effect improvements in the efficiency and costs involved in running the plants. The addition of sensors and controls for connection to the base EMCS system opens up significant opportunities for additional energy savings, reduced system failures, reduced manpower requirements and increased life on equipment by early detection of component degradation.

ECIP's are capable of standing on their individual and collective merit and each has the potential for reducing operating costs and improving performance. If all the projects are implemented, the resulting improvements will be a dramatic difference from current costs and performance. Below is a summary of the projects with their respective costs, savings and paybacks.

Project No.	Initial Cost	Savings	Total Discounted Savings	Payback	Savings to Investment Ratio	1st Yr Energy Savings MBTU
1	2,587,081	501,485	7,812,923	5.16	3.02	12,719
2	1,127,994	313,692	4,924,285	3.60	4.37	8,059
3	2,336,513	335,261	6,601,264	6.58	2.83	41,431
4	<u>1,232,811</u>	<u>236,319</u>	<u>4,311,447</u>	5.22	3.50	<u>24,070</u>
	7,284,399	1,386,757	23,649,919			86,279

If all projects are implemented,

$$\text{Simple Payback} \quad \frac{7,284,399}{1,386,757} = 5.25 \text{ yrs.}$$

$$\text{SIR} \quad \frac{7,284,399}{23,649,919} = 3.25$$

Because building 25910 is the larger of the two buildings, the initial cost of its projects is greater. Consequently, Projects 1 and 3 have the longer payback periods and lower Savings to Investment Ratios.

The material required to generate this report came from many sources, and without the great help of Curtis Oglesby of Fort Gordon and Walt Hohne and Rob Callahan at Savannah District Corps of Engineers, it would not have been possible to put together as meaningful report as we have. There is one point that should be noted - performing the necessary calculations, the figures used for boiler efficiency are assumed. Even though boiler and chiller efficiencies were tested, the results were sufficiently different from an acceptable standard that they could not be used with any degree of confidence. Recent articles in the ASHRAE Journal indicate that the subject plant boiler efficiencies are much lower than standard boiler efficiency ratings because of operation, maintenance and age.

The studies clearly indicate a critical need to upgrade both central plants to improve the efficiency of operation and to drive down the cost of running the plants. The Central Utility Plants (North and South) are in need of major renovation. The ability of each plant to provide services to existing buildings during peak load conditions is marginal. Expansion to existing buildings and the addition of new buildings will exacerbate the problem: demand for reheating and cooling services will soon exceed the capacity of the plants to provide these services. Renovation of the existing facilities is the most cost effective way to extend the service life of the plants and provide the required services to Base personnel. The format of this report is intended to facilitate the client's application for ECIP funding. Each ECIP can stand on its own merits and can be implemented alone. However, the improvements to operations and savings in manpower at each plant are more dramatically realized when both projects at each plant are fully implemented.